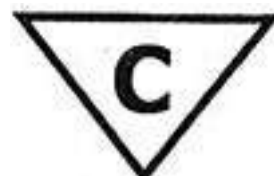


**0193**  
**TS**



Total No. of Questions – 24  
Total No. of Printed Pages – 4

Regd. No. 

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**Part - III**  
**MATHEMATICS, Paper-I(B)**  
**(English Version)**

Time : 3 Hours]

[Max. Marks : 75

Note : This question paper consists of three sections A, B and C.

**SECTION – A**

**10 × 2 = 20**

I. Very short answer type questions :

- (i) Attempt **all** questions.
- (ii) Each question carries two marks.

1. Find the value of 'y', if the line joining the points (3, y) and (2, 7) is parallel to the line joining the points (1, 4), (0, 6).
2. Find the value of 'p', if the straight lines  $x + p = 0$ ,  $y + 2 = 0$  and  $3x + 2y + 5 = 0$  are concurrent.
3. Find the fourth vertex of the parallelogram whose consecutive vertices are (2, 4, -1), (3, 6, -1) and (4, 5, 1).
4. Find the angle between the planes  $x + 2y + 2z - 5 = 0$  and  $3x + 3y + 2z - 8 = 0$ .
5. Compute  $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right)$ .

6. Compute  $\lim_{x \rightarrow \infty} \frac{8|x| + 3x}{3|x| - 2x}$ .
7. If  $f(x) = 7^{x^3 + 3x}$  ( $x > 0$ ), then find  $f'(x)$ .
8. If  $x = \tan(e^{-y})$ , then show that  $\frac{dy}{dx} = \frac{-e^y}{1+x^2}$ .
9. Find  $dy$  and  $\Delta y$  of  $y = x^2 + x$  at  $x = 10$  when  $\Delta x = 0.1$ .
10. Verify Rolle's theorem for the function  $f : [3, 8] \rightarrow \mathbb{R}$  be defined by  $f(x) = x^2 - 5x + 6$ .

### SECTION - B

5 × 4 = 20

II. Short answer type questions :

(i) Attempt any **five** questions.

(ii) Each question carries **four** marks.

11. A(5, 3) and B(3, -2) are two fixed points. Find the equation of locus of P, so that the area of  $\Delta PAB$  is 9 sq. units.

12. When the axes are rotated through an angle  $\frac{\pi}{4}$ , find the transformed equation of  $3x^2 + 10xy + 3y^2 = 9$ .

13.  $x - 3y - 5 = 0$  is the perpendicular bisector of the line segment joining the points A, B. If A = (1, -3), find the coordinates of 'B'.

14. Show that  $f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2}(b^2 - a^2) & \text{if } x = 0 \end{cases}$

where a and b are real constants, is continuous at  $x = 0$ .

15. If  $ay^4 = (x + b)^5$  then  $S_{yy''} = (y')^2$ .
16. Find the lengths of subtangent, subnormal at a point 't' on the curve  $x = a(\cos t + t \sin t)$ ,  $y = a(\sin t - t \cos t)$ .
17. The volume of a cube is increasing at a rate of 9 cubic centimetres per second. How fast is the surface area increasing when the length of the edge is 10 centimetres?

**SECTION - C**

**5 × 7 = 35**

III. Long answer type questions :

(i) Attempt any five questions.

(ii) Each question carries seven marks.

18. Find the orthocentre of the triangle whose vertices are (5, -2), (-1, 2) and (1, 4).
19. Show that the area of the triangle formed by the lines  $ax^2 + 2hxy + by^2 = 0$  and the line  $lx + my + n = 0$  is  $\left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2hlm + bl^2} \right|$ .
20. The condition for the line joining the origin to the point of intersection of the circle  $x^2 + y^2 = a^2$  and the line  $lx + my = 1$  to coincide
21. Find the direction cosines of two lines which are connected the relation  $l + m + n = 0$  and  $mn - 2nl - 2lm = 0$ .

22. If  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$  then prove that  $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$ .

23. At a point  $(x_1, y_1)$  on the curve  $x^3 + y^3 = 3axy$ , show that the tangent is  $(x_1^2 - ay_1)x + (y_1^2 - ax_1)y = ax_1y_1$ .

24. A window is in the shape of rectangle surmounted by a semicircle. If the perimeter of the window is 20 ft. find the maximum area.

